

H E A D S
OF
LECTURES ^{8.}

ON
Philosophical Chemistry,

DELIVERED AT
NEW COLLEGE, HACKNEY.

BY WILLIAM RUSSELL NOTCUTT, *L*
FELLOW OF THE LINNEAN SOCIETY.



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1796.

LECTURES HEADS OF LECTURES PHILOSOPHY



The peculiar province of each of these branches
Chemistry defined—the examination of the com-
position of bodies with regard to their Nature, Proper-
ties, and manner of Combination.
Of bodies, simple, or mixed. How these terms are
philosophically to be understood.
Of the general properties of Matter—Extension, Divi-
sion, Figure, &c. (as it has been improperly called)
and Motion.

Of the several kinds of Attraction.
Of the several kinds of Cohesion—that power by which the
particles of bodies are connected and made to cohere.
Of the several kinds of Repulsion—that power by which the
particles of bodies are repelled and made to separate.

1796

HEADS OF LECTURES,

&c.

Introduction.

NATURAL SCIENCE—Definition—Division into *Natural History, Natural Philosophy* and *Chemistry*.

The peculiar province of each of these Branches.

CHEMISTRY defined—the examination of the constituent parts of Bodies, with regard to their Nature, Proportion, and manner of Combination.

Of *Body, Substance, or Matter*—How these terms are philosophically to be understood.

Of the general Properties of Matter—*Extension, Divisibility, Vis Inertiæ*, (as it has been improperly called) and *Attraction*.

Of the several species of *Attraction*.

I. *Attraction of Cohesion*—that power by which the particles of Bodies are connected and made to cohere;
B producing

producing the diversity of texture, observable in natural substances.

Of its Laws.

II. *Attraction of Gravitation*—the tendency which all bodies have towards the center of the earth; constituting the *Weight* of bodies.

Of its Laws.

III. *Attraction of Magnetism*—that which obtains between a kind of ferruginous stone, called the *Magnet*, and Iron or Steel.

IV. *Attraction of Electricity*—that which manifests itself upon presenting a piece of Glass or any resinous matter, previously rubbed with a dry flannel, to a feather or any other light substance.

V. *Chemical or Elective Attraction*—that tendency which the constituent parts of bodies have to unite readily with some substances in preference to others.

How the relations thus subsisting between different substances are expressed by Chemists; forming *Tables of Elective Attractions*.

Of the means employed to counteract the Attraction of Cohesion, in order to facilitate chemical union.

Of the remarkable changes in the obvious properties of bodies, which often accompany chemical combinations.

Of Caloric, (Fire or Matter of Heat)

Its Nature—counteracts the attraction of Cohesion—exists in two different forms; in the one, it is active, producing

ducing *Warmth, Expansion, &c.* therefore said to be *sensible*: in the other, it is quiescent, possessing no obvious properties, hence denominated *latent*.

Sensible Caloric—Its tendency to obtain an equilibrium—passes through different bodies with a greater or less facility, nearly in the proportion of their densities.

Produces in some bodies an uniform variation in bulk; hence the construction of the *Thermometer*.

Bodies differ in their *Capacities* for Caloric.

To the action of Caloric may be referred the processes of *Distillation* and *Sublimation*; and to its tendency to maintain an uniformity of temperature, that of *Condensation*.

Latent Caloric—Of the many Phenomena which admit of a satisfactory explanation upon this doctrine,

- I. The changes of temperature in different mixtures and the production of cold by evaporation.
- II. Various Phenomena attending congelation.
- III. The origin of animal heat.

Of the distinction between combustible and incombustible bodies.

By what means inflammation and combustion are supported.

Of the general properties of Aeriform Fluids, or Gases.

- I. They have weight.
- II. They press in all directions.

III.

III. They are elastic, capable of compression and expansion.

IV. They conduct sound.

These propositions established by experiments on the *Air Pump*.

Their Application—the suspension of Mercury in the Barometer—the raising of Water by Pumps—the suction of Animals—the effects of the Air Gun—Intermitting Springs, &c. &c.

Of the Composition of Atmospherical or common Air.

Consists of a mixture of two kinds of Gases, the one, alone capable of supporting Combustion and Respiration, called *Oxygen Gas*; (*Dephlogisticated or Vital Air*) the other, destructive both to Life and Flame, hence called *Azotic Gas*. (*Phlogisticated Air*).

This Composition proved both by *Analysis* and *Synthesis*.

Of the different methods made use of to ascertain the purity of Atmospherical Air, that is, the proportion of *Oxygen Gas* in a given quantity.

Of Oxygen Gas.

Constitutes about one third of the mass of our Atmosphere—How obtained in a separate form so as to be made the subject of Experiment,

Appears

Appears to be a compound of a certain base *Oxygen*, united with *Caloric* and *Light*.

Decomposed in *Combustion*—its base unites with the combustible body, (hence the terms *Oxyd* and *Oxydation*) whilst the *Caloric* and *Light* are disengaged; hence the origin of *Heat* and *Flame* which accompany *Combustion*.

Decomposed also in *Respiration*; hence the origin of *Animal Heat*.

By *Combustion* with *Hydrogen Gas* (*Inflammable Air*) it forms *Water*.

Communicates to many Bodies the properties of *Acids*; hence its Name.

Heavier than *Atmospherical Air*.

Of *Azotic Gas*.

Constitutes about two thirds of the mass of our *Atmosphere*.

A constituent part of *Animal Matter*.

How obtained—*Destructive* to *Flame* and to *Animal Life*, but not to *Vegetation*.

When brought into chemical union with *Oxygen Gas*, *Nitrous Acid* is produced; hence sometimes called *Nitrogen Gas*.

In combination with *Hydrogen Gas*, it forms *Animalic*.

Lighter

Lighter than Atmospherical Air.

Of the provision made by Nature for maintaining a due proportion between the two component parts of Atmospherical Air.

Of Water.

Exists in three different states—*Ice, Water, and Steam*; depending upon the influence of Caloric.

Expands in the act of congelation.

Possesses a solvent power over most bodies; hence seldom found pure.

Requires, like other fluid bodies, a greater or less degree of Heat to convert it into Vapour, according to the pressure upon its surface.

Highly elastic in the state of Vapour, hence the construction of *Steam Engines*.

Decomposed by heated Metals—the Metals become *oxydated* and *Hydrogen Gas* is at the same time disengaged; it is a compound therefore of *Oxygen* and *Hydrogen*.

Repeated experiments have proved that 100 parts of Water, consists of 85 of the former and 15 of the latter.

The recomposition of Water confirms this Analysis.

Many Phenomena, formerly inexplicable, are now considered as the necessary consequences of the Composition or Decomposition of Water—the *torrents of Rain* which
succeed

succeed Atmospheric Detonations—the manner of assisting Combustion by sprinkling Water upon Coals—the Phenomena of the Eolipile, &c.

Of Hydrogen. (*Inflammable Air*)

Found native—Obtained in its purest form by the decomposition of Water.

Twelve or fourteen times lighter than common Air; hence the construction of *Air Balloons*.

Unfit for respiration—Of its late application in *Medicine*.

Exhibits various Characters according to its purity and the nature of the adventitious substances; hence the different kinds of inflammable Air mentioned by philosophical Chemists; of which, Hydrogen constitutes the general basis.

Bodies containing much Hydrogen in their composition, as *Oil, Spirits of Wine, &c.* afford Water as a product of their combustion.

Of Acids.

Consist of inflammable substances combined with Oxygen—the degree of Acidity depending upon the proportion of the latter.

Their general properties—sour to the taste, change vegetable *blue* colours to *red*, &c.

Division

Division into *mineral, vegetable and animal.*

The mineral Acids—*Sulphuric, Nitric, Muriatic, Carbonic, Fluoric, Boracic, Arsenic, Tungstonic and Molybdenic.*

Of Sulphuric (Vitriolic) Acid.

How prepared. When pure—inodorous, without colour very ponderous and intensely sour.

Attracts moisture and produces an increase of temperature on mixture with Water.

Of the peculiar properties of *Sulphurous Acid.*

Application of these Acids in the *Arts, &c.*

Of Nitric Acid. (Spirit of Nitre)

Composed of Azot and Oxygen as mentioned before.

The usual process for obtaining it.

Its character—colourless, very caustic, of a strong and pungent smell, destroys colours, turns animal and vegetable substances yellow, &c.

Decomposed by Metals, by Heat, by exposure to the rays of the Sun, and in a more remarkable manner, by inflammable substances.

Deprived of a portion of its Oxygen, it becomes *Nitrous Acid*—This generally of an orange colour.

Of their application in the *Arts, &c.*

Of Muriatic (Marine) Acid.

Its base unknown—Abounds in the mineral kingdom combined with different substances—How disengaged.

In its genuine form—gaseous, possessing a pungent and suffocating smell; but usually employed united with Water to which it imparts a bright straw colour.

Capable of combining with a greater proportion of Oxygen, and thus becoming *Oxy-Muriatic Acid*.

Of the peculiar properties of this Acid—its late extensive application in *Bleaching, &c.*

Observations on the *theory* of Bleaching.

Of Carbonic Acid. (Fixed Air)

Composed of *Carbon (Charcoal)* and Oxygen.

Exists ready formed in all the *calcareous* stones—How separated from this combination.

Its character—gaseous, heavier than Atmospheric Air, extinguishes flame and is unfit for respiration.

Acidulates Water, giving it the properties of *Pymont Water*.

Successfully employed in *Medicine* in cases of putrid disease.

Of Fluoric Acid. (Acid of Fluor)

Its base unknown—Native in the earthy substance called *Fluor*—How separated.

Its character—gaseous, of a pungent smell, extinguishes flame, dissolves *siliceous* earth and even holds it in solution in its gaseous form.

Of its late application in *Etching upon Glass*.

Of Boracic, Arsenic, Tungstenic, and Molybdenic Acids.

Their Sources—Preparation—Properties and Application.

Of Vegetable Acids.

Formed by the union of Carbon and Hydrogen with Oxygen in different proportions.

Principal of these—*Acetous, Tartarous, Oxalic* and *Succinic*.

Of Acetous Acid. (Vinegar)

Formed by the fermentation of Wine; hence its common Name.

How

How purified and concentrated so as to become *Acetic Acid*. (*Radical Vinegar*)

Its Properties and Application.

Of Tartarous, Oxalic and Succinic Acids.

Their Sources—Preparation—Properties and Application.

Of other vegetable Acids of a less perfect nature, viz. *Citric, Gallic, Mallic, Camphoric, Benzoic, Pyrotartarous, Pyromucous* and *Pyrolignous*.

Of Animal Acids.

Principal of these—*Phosphoric* and *Prussic*.

Of Phosphoric Acid.

Composed of *Phosphorus* and *Oxygen* united by rapid and complete combustion.

In its purest form, concrete ; but generally employed combined with *Water*.

Easily decomposed.

Of Prussic Acid. (Colouring Matter of Prussian Blue)

Its radical—a mixture of *Carbon, Hydrogen* and *Azot*. Possesses few acid properties.

Of other Acids of animal origin, viz. *Lactic, Saccholactic, Formic, Bombic, Sebacic* and *Litbic*.

Of Alkalis.

Distinguished by their acrid and burning taste, their causticity, the property of changing the *blue* colour of Violets to *green*, and of uniting intimately with the Acids; forming with them *Compound or Neutral Salts*.

Only three species known—*Potash*, *Soda* and *Ammoniac*; the two former called *fixed Alkalis*, requiring an intense heat to volatilize them; the third named *volatile Alkali*, from possessing the opposite property.

Of Potash. (*Vegetable Alkali*)

Its Sources and Preparation.

Its character—dry, solid, white, caustic, very deliquescent, combines with *Silex* or *Flint* by fusion and forms with it a transparent Compound.

Of its Application in *Dying*, *Scowering*, *Bleaching*, *Glass-making*, &c.

Of its principal Compounds.

I. *Nitrat of Potash*. (*Nitre* or *Saltpetre*) Found native—How purified—Its Properties and Applications.

II. *Sulphat of Potash*, (*Nitriolated Tartar*)

III. *Tartaric of Potash*, (*Soluble Tartar*)

IV. *Acidulous Tartaric of Potash*, (*Cream of Tartar*)

V. *Acetic of Potash*, (*Diuretic Salt*)

VI.

VI. *Oxy-Muriat of Potash,*

VII. *Carbonat of Potash, (Mild or Aerated Vegetable Alkali) &c. Their Preparation—Properties and Application.*

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*Of Soda. (Mineral Alkali)*

Its Sources and Preparation.

Its character—dry, solid, white, caustic, efflorescent, combines with *Silex* by means of fusion, &c.

Of its Application in *Bleaching, Dying, &c.*

Of its principal Compounds.

I. *Muriat of Soda. (Common Salt)* Abounds in the mineral kingdom—How purified—Its sensible properties.

Of its application in *Agriculture, Glazing of Earthen Ware, &c.*

II. *Borat of Soda. (Borax)* Found native—How purified—Its Properties.

Of its application in the *Arts, &c.*

III. *Sulphat of Soda, (Glauber's Salt)*

IV. *Phosphat of Soda, (Phosphorated Soda)*

V. *Carbonat of Soda, (Mild or Aerated mineral Alkali) &c. Their Preparation—Properties and Application.*

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Of Ammoniac. (Animal or Volatile Alkali)

Composed of Azot and Hydrogen, as mentioned before.

How

How prepared.

Its character—gaseous, of a pungent and suffocating smell, combines with Water, &c.

Employed in *Medicine*.

Of its principal Compounds.

I. *Muriat of Ammoniac*, (*Sal Ammoniac*) How prepared—Its sensible Properties.

Of its application in *Tinning*, *Soldering*, &c.

II. *Sulphat of Ammoniac*, (*Glauber's Sal Ammoniac*)

III. *Nitrat of Ammoniac*, (*Ammoniacal Nitre*)

IV. *Carbonat of Ammoniac*, (*Mild Volatile Alkali or Smelling Salts*) &c. Their Preparation—Properties and Application.

Of Earths.

Distinguished by being dry, inodorous, unalterable in the Fire, infusible and scarcely, if at all, soluble in Water.

The principal of these—*Baryt*, *Lim*, *Magnesia*, *Alumin*, and *Silex*.

Other distinct species lately discovered which have not been much examined—*Strontian*, *Sidnean*, *Adamantine* and *Fargon Earths*.

Of Baryt. (*Ponderous Earth*)

Never found in a disengaged state; but generally in combination with Sulphuric or Carbonic Acid.

How

How obtained pure.

Its character—ponderous, pulverulent and extremely white.

Of its application in the *Analysis of Waters, &c.*

Of its principal Compounds.

I. *Sulphat of Baryt. (Ponderous Spar)* Found native in quantity—Its sensible properties.

II. *Carbonat of Baryt. (Aërated Ponderous Earth)* Native also but less common—Its sensible Properties.

III. *Nitrat of Baryt,*

IV. *Muriat of Baryt, &c.* Their Preparation—Properties and Application.

Of Lime. (Calcareous Earth)

Found pure only near BATH. Very abundant in nature combined with different Acids.

How disengaged from these combinations.

Its character—white, soft, has an acrid and burning taste, gives out heat on its union with Water, &c.

Supposed to be of *animal* origin.

Of its application in *Cements, Bleaching, Sugar-baking, Metallurgy, &c.*

Of its principal Compounds.

I. *Carbonat of Lime. (Calcareous Stone)* Of the great variety

variety of forms under which this combination appears—*Chalk, Lime-stone, Marble, Alabaster, &c.* Their Properties and Application.

II. *Sulphat of Lime. (Gypsum or Plaster-stone)* Native—Its sensible properties.

Of its application in *Cements, Modelling, &c.*

III. *Fluat of Lime. (Fluor Spar)* Native—Abundant in *DERBYSHIRE*. Its Properties and Application.

IV. *Phosphat of Lime, (Calcareous Phosphoric Salt)*

V. *Nitrat of Lime, (Calcareous Nitre)*

VI. *Muriat of Lime, (Calcareous Marine Salt)* &c. Their Sources—Properties and Application.

Of Magnesia. (Muriatic Earth)

Never found disengaged from all foreign substances—Exists in several *mineral Waters* united with Sulphuric Acid—Abounds also in *Asbestos, Soap Rock, Muscovy Talc, &c.*

How disengaged from these combinations.

Its character—white, soft, friable, unalterable in the Fire, and not perceptibly soluble in Water.

Used chiefly in *Medicine*.

Of its principal Compounds.

I. *Sulphat of Magnesia. (Epsom Salt)* Native in the Waters of *EPSOM, LORRAINE, &c.* Its Properties and Application.

II. *Carbonat of Magnesia. (Common Magnesia)* Its Preparation—Properties and Application.

Of Alumin. (*Argillaceous Earth*)

Never discovered pure—The chief ingredient in *Clay*
—Found also in combination with Sulphuric Acid.

How obtained in its purest form.

Its character—soft, adhesive to the tongue, makes a
paste with Water, hardens and contracts in the Fire, &c.

Of its Application in *Pottery, Scouring, &c.*

Of its principal Compounds.

I. *Sulphat of Alumin. (Common Alum)* Native—Its
sensible properties—Of its Application in *Dying, Refi-*
ning of Liquors, &c.

II. *Carbonat of Alumin, (Aërated argillaceous Earth)*

III. *Nitrat of Alumin, &c.* Their Preparation—Pro-
perties and Application.

Of Silex. (*Flinty Earth*)

Nearly pure in *Rock Crystal*—Abounds in *Sand, Flint,*
Quartz, Agate, &c.

How obtained entirely free from combination.

Its character—rough to the touch, infusible, incom-
bustible, insoluble in Water and most Acids, unites with
Alkalies in a strong Heat, &c.

Of its Application in *Glass-making, Pottery, &c.*

D

Of

Of Metals.

Distinguished by their specific gravity, opacity, brilliancy and fusibility.

Generally found combined with some foreign Substance—In this state called *Ores*. When united with *Sulphur* or *Arsenic*, said to be *mineralized*.

Seventeen Species known — Divided into

I. PERFECT METALS: *Platina*, *Gold* and *Silver*.

II. IMPERFECT METALS: *Iron*, *Copper*, *Lead*, *Tin* and *Mercury*.

III. SEMI-METALS: *Zinc*, *Bismuth*, *Antimony*, *Arsenic*, *Cobalt*, *Manganese*, *Nickel*, *Tungsten* and *Molybdana*.

This Division founded upon erroneous principles.

Of the *working* and *assaying* of *Ores*.

Of Platina.

Discovered in the gold mines of *SOUTH AMERICA*, in small grains, mixed with ferruginous sand.

Its character—of a grey white colour, not very brilliant, infusible in the strongest Fire, soluble only in *Oxy-Muriatic Acid*, the heaviest, least combustible and least alterable of all Metals.

Of its *Alloys* with *Silver*, *Copper*, *Tin*, &c.

Of its Application in the *Arts*, &c.

Of Gold.

Found nearly pure under different forms—Sometimes mineralized by *Sulphur*.

Refined by *Cupellation*.

Its character—of a fine yellow colour, very ductile and tenacious, of great specific gravity, unalterable in the strongest Fire, readily soluble in Oxy-Muriatic Acid, and convertible into a purple Oxyd by the Electric Shock.

Of its Alloys with *Silver*, *Iron*, *Copper*, &c.

Of the precipitates from its solution in Oxy-Muriatic Acid by different substances—*Aurum Fulminans*, *Purple Powder of Cassius*, &c.

Of its Application in *Coinage*, *Gilding*, *Enamelling*, *Soldering*, &c.

Of Silver.

Found in several different states—pure, mineralized by *Sulphur* and *Arsenic*, united with *Antimony*, in combination with Muriatic Acid, &c.

Its character—white, brilliant, less ductile and tenacious than Gold, nearly unalterable by Fire, easily soluble in Nitric Acid, &c.

Of its Alloys with *Copper*, *Lead*, &c.

In combination with Nitric Acid—*Nitrat of Silver*, (*Lunar Nitre*, or, when deprived of its *Water of Crystallization*

lization, Lunar Caustic) Employed in the *Analysis of Waters, Marking of Linen, Surgery, &c.*

Of the precipitates from its solution by different substances—*Muriat of Silver, (Luna Cornea) Arbor Diana, Argentum fulminans, &c.*

Of its Application in *Coinage, Silversmithing, Plating, &c.*

Of Iron.

Discovered in some places free from mixture—More generally found either mineralized, oxydated, or in union with an acid.

Its character—white inclining to grey, very tenacious, difficult to fuse, very combustible, gives fire with flint, readily decomposes water, obeys the magnet, &c.

Its different states—*Crude Iron, Bar Iron and Steel.*

Of its Alloys with other Metals.

United with Oxygen—*Ochres, Colcothar, &c.*

Of its principal combinations with Acids.

I. *Sulphat of Iron, (Green Copperas)* Its Sources and Preparation—Of its Application in *Dying, Making of Inks, &c.*

II. *Prussiat of Iron, (Prussian Blue)* Found native—The usual mode of Preparation—Its Application in *Painting, Dying, &c.*

III. *Muriat of Iron, (Salt of Iron)*

IV. *Phosphat of Iron, &c.* Their Preparation, Properties and Uses.

By

By mixture with *Sulphur*, produces spontaneous inflammation.

Of the extensive Application of this Metal in the *Arts*, &c.

Of Copper.

Found in several different forms—pure, mineralized, combined with *Antimony*, in union with Carbonic Acid, &c.

Its character—red, soft, affords a disagreeable smell by friction, nauseous to the taste, ductile, very tenacious, combustible, burns with a green flame, &c.

Of its Alloys with other Metals—*Bronze*, *Prince's Metal*, *Brass*, *Bell Metal*, *Tombac*, *Pinchbeck*, *White Copper*, &c.

Of its principal combinations with Acids.

- I. *Sulphat of Copper*, (*Blue Vitriol*)
- II. *Acetat of Copper*, (*Verdegris*)
- III. *Arsenat of Copper*, (*Scheele's green Pigment*)
- IV. *Nitrat of Copper*, &c. Their Preparation—Properties and Application.

Of the precipitates from its solution in Nitric Acid by different substances—*Copper of Cementation*, *Verditer*, &c.

The peculiar properties of its solution in Ammoniac.

Of its Application in *Navigation*, *Gunnery*, *Building*, *Painting*, *Dying*, &c.

Of

Of Lead.

Generally found mineralized by Sulphur—Sometimes in combination with Sulphuric, Carbonic or Phosphoric Acid.

Its character—of a dull bluish colour, soft, of little tenacity, heavy, very fusible, oxydable and vitrifiable by heat, &c.

Of its Alloys with other Metals—*Pewter, Solders, &c.*

Its Oxyds—*Ceruse or White Lead, Minium or Red Lead, Litharge, &c.*

Of its principal combinations with Acids.

I. *Sulphat of Lead, (Nitriol of Lead)*

H. *Carbonat of Lead, (Aerated Lead)*

III. *Muriat of Lead, (Horny Lead, or, after fusion, Patent Yellow)*

IV. *Acetit of Lead, (Sugar of Lead) &c.* Their Preparation—Properties and Application.

Of the Application of this Metal in *Building, Gunnery, Glass-making, Glazing of Earthen-ware, Painting, Assaying, &c.*

Of Tin.

Seldom, if ever, found entirely free from combination—Generally mineralized—Sometimes united with other Metals.

Its

Its character—of a brilliant white colour, soft, light, malleable, of no great tenacity, very fusible, very combustible, produces a crackling noise when bended, &c.

Of its Alloys with other Metals—*Pewter, Sir I. Newton's fusible Metal, &c.*

In union with Oxygen—*Putty.*

Of its principal Combinations with Acids.

I. *Sulphat of Tin, (Vitriol of Tin)*

II. *Nitrat of Tin, (Nitrated Tin)*

III. *Oxy-Muriat of Tin, &c.* Their Preparation—Properties and Application.

Combined with Sulphur—*Sulphuret of Tin. (Aurum Musivum or Mosaic Gold)* Its Uses.

Of the Application of this Metal in *Tinning, Silvering, Enamelling, Polishing, Painting, Dying, &c.*

Of Mercury.

Discovered in several places pure—More commonly mineralized by *Sulphur*—Sometimes in combination with *Muriatic Acid*.

Its character—white, brilliant, fluid at the ordinary temperature of the Atmosphere, very fusible, unalterable by exposure to the Air, &c.

Of its Alloys with other Metals—*Amalgam of Gold, Silver, &c.*

Its Oxyds—*Red Precipitate, White Precipitate, Turbith Mineral, &c.*

Of

Of its principal combinations with Acids.

- I. *Sulphat of Mercury, (Vitriol of Mercury)*
- II. *Muriat of Mercury, (Calomel)*
- III. *Oxy-Muriat of Mercury, (Corrosive Sublimate)*
- IV. *Acetis of Mercury, (Mercurial foliated Earib)*
- V. *Nitrat of Mercury,*
- VI. *Borat of Mercury, &c.* Their Preparation—
Properties and Application.

United with *Sulphur* by trituration—*Ethiops Mineral*—more intimately by heat—*Cinnabar*, or, when reduced to powder, *Vermillion*.

Of its Application in *Metallurgy, Gilding, Silvering, Assaying, Refining, Painting, Medicine, &c.*

Of Zinc.

Found in various states—oxydated, mineralized by *Sulphur*, in combination with *Sulphuric Acid*, &c.

Its character—of a blue white colour, very brilliant, in some degree malleable, easy to fuse, very inflammable, &c.

Its Alloys with other Metals—*Brass, Pinchbeck, Tuttnag, &c.*

Of its Oxyds—*Calamine, Flowers of Zinc or Philosophical Wool, &c.*

Of its principal combinations with Acids.

I. *Sulphat of Zinc, (White Copperas)*

II. *Nitrat*

II. *Nitrat of Zinc, &c.* Their Preparation—Properties and Uses.

Of its Application in *Gunnery, Statuary, Painting, Medicine, &c.*

Of Bismuth.

Rarely found pure—sometimes oxydated—more frequently mineralized by *Arsenic*.

Its character—of a yellowish white, brittle, easy of fusion, oxydation and vitrification, &c.

Its Alloys with other Metals—*Pewter, Fusible Metal, &c.*

United with Oxygen—*Flowers of Bismuth, Magistery of Bismuth, (White Paint for the Skin) &c.*

Of its combinations with Acids.

Of its Application in *Assaying, Silvering of Glass, Making of Printing Types, &c.*

Of Antimony.

Generally found mineralized by *Sulphur* or *Arsenic*—sometimes oxydated.

Its character—of a fine white, laminated, brittle, difficult to fuse, easy of oxydation, &c.

Of its Alloys with other Metals.

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Its

Of its principal combinations with Acids.

- I. *Sulphat of Mercury, (Vitriol of Mercury)*
- II. *Muriat of Mercury, (Calomel)*
- III. *Oxy-Muriat of Mercury, (Corrosive Sublimate)*
- IV. *Acetit of Mercury, (Mercurial foliated Earth)*
- V. *Nitrat of Mercury,*
- VI. *Borat of Mercury, &c.* Their Preparation—
Properties and Application.

United with *Sulphur* by trituration—*Ethiops Mineral*—more intimately by heat—*Cinnabar*, or, when reduced to powder, *Vermillion*.

Of its Application in *Meteorology, Gilding, Silversetting, Assaying, Refining, Painting, Medicine, &c.*

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Its character—of a yellowish white, brittle, easy of fusion, oxydation and vitrification, &c.

Its Alloys with other Metals—*Pewter, Fusible Metal, &c.*

United with Oxygen—*Flowers of Bismuth, Magistery of Bismuth, (White Paint for the Skin) &c.*

Of its combinations with Acids.

Of its Application in *Assaying, Silvering of Glass, Making of Printing Types, &c.*

Of Antimony.

Generally found mineralized by *Sulphur* or *Arsenic*—sometimes oxydated.

Its character—of a fine white, laminated, brittle, difficult to fuse, easy of oxydation, &c.

Of its Alloys with other Metals.

Its Oxyds—*Argentine Flowers of Antimony, Powder of Algoroth, Diaphoretic Antimony, &c.*

Of its principal combinations with Acids.

I. *Oxy-Muriat of Antimony, (Butter of Antimony)*

II, *Sulphat of Antimony, &c.* Their Preparation—Properties and Uses.

United with Sulphur—*Crude Antimony.*

Of other Antimonial Preparations—*Antimoniated Tartar of Potash, (Emetic Tartar) Kermes Mineral, &c.*

Of its Application in Medicine, Making of Printing Types, &c.

Of Arsenic.

Found either mineralized by Sulphur, or in combination with other Metals.

Its character—of a bluish grey colour, brilliant, subject to tarnish, fragile, of a lamellated texture, &c.

Of its Alloys with other Metals.

Combined with a certain portion of Oxygen—*Common White Arsenic.*

Of the peculiar Properties of this Oxyd.

Of its combinations with Acids

United with Sulphur—*Realgar, or Orpiment*, accordingly as the heat is applied.

Of its Application in Glass-making, Dying, Painting, Imitating Silver, Manufacturing of Shot, &c.

Of Cobalt.

Generally found mineralized by *Sulphur* or *Arsenic*—sometimes united with other Metals.

Its character—of a grey colour, granulous, fragile, difficult of fusion, not easily oxydated, &c.

Of its combinations with Acids.

By solution in Oxy-Muriatic Acid—*Hellot's Sympathetic Ink.*

Of its Application in *Colouring Glass, Enamelling, Painting, Washing, &c.*

Of Manganese.

Discovered native in no other state than that of an Oxyd.

Its character—of a grey white colour, hard, brittle, difficult to fuse, oxydable by simple exposure to the Air, &c.

Its Alloys with other Metals.

Of its combinations with Acids.

By mixture with *Oil*, produces spontaneous inflammation.

Of its Application in *Glass-making, Blacking, Glazing, &c.*

Of

Of Nickel, Tungsten and Molybdæna.

Their Natural History—sensible Properties and Application.

Of Inflammables.

Distinguished by their levity and the property of decomposing, more or less rapidly, Oxygen Gas; that is, of combining with Oxygen and disengaging from it, Caloric and Light.

Divided into

I. SIMPLE INFLAMMABLES,
or, such as cannot be decomposed.

Diamond, Hydrogen, Sulphur, Phosphorus, and Carbon.

II. COMPOUND INFLAMMABLES:

Carburet of Iron, Bitumens, Hepatic Gases, Alcohol, Resins, Essential Oils, Fixed Oils, Camphor, Wax, Fat, Spermaceti, Butter, Ambergris, &c.

Of

Of the Diamond.

Its Natural History.

Its character—the hardest of all known substances, possesses an extraordinary refractive power, burns with a weak flame, &c.

Of its Application in *Cutting of Gems, Seals, Glass, &c.*

Of Hydrogen.

One of the principles of Water, already considered, (p. 9)

Of Sulphur.

Generally found where vegetable decomposition takes place—Procured in large quantities from its combinations with Metals.

Its character—yellow, electric, insoluble in Water, by slow combustion produces Sulphurous Acid, by rapid combustion, Sulphuric Acid, &c.

Of its Compounds.

- I. *Sulphuret of Potash, Soda, &c. (Alkaline Hepars)*
 - II. *Sulphuret of Baryt, Lime, &c. (Earthy Hepars)*
- &c. Their Preparation—Properties and Uses.

Combined

Combined with Potash and Nitrat of Potash—*Pulvis Fulminans*.

Of its Application in *Taking Impressions, Bleaching, Medicine, &c.*

Of Phosphorus.

Exists in all the three kingdoms—usually obtained from animal substances.

How prepared.

Its character—of a flesh colour, transparent, has the consistence of wax, burns with a lambent flame at the common temperature of the atmosphere, producing Phosphorous Acid, &c.

Precipitates Metals from their solutions.

Dissolved in Oils—*Liquid Phosphorus*.

Of its Application in *Eudiometry, &c.*

Of Carbon. (Charcoal)

Abounds in animals and vegetables—Constitutes the solid mass of the latter—A constituent part of most of the compound Inflammables.

How obtained pure.

Its character—black, sonorous, brittle, has a strong attraction for Oxygen, producing by this combination Carbonic Acid, &c.

Procured

Procured from *Oils* of a light pulverulent form—*Lamp Black*.

Of the effects of Acids and Alkalies upon it.

Combined with Sulphur and Nitrat of Potash—*Gunpowder*.

Of its Application in *Metallurgy*, *Refining of Sugar*, *Purifying of Water*, &c.

Of Carburet of Iron. (*Plumbago* or *Black Lead*)

Found native in considerable quantity.

Its character—of a shining black, has a greasy feel, insoluble in Acids, indestructible by heat alone, leaves a black trace upon paper, &c.

Of its Application in *Chemistry*, *Making of Pencils*, *Polishing*, &c.

Of Bitumens.

Enumeration—*Naptha*, *Petroleum*, *Asphaltum*, *Coal*, *Jet*, *Peat*, *Amber*, &c.

Their Natural History—Sensible Properties and Application.

Of Hepatic Gases.

Hydrogen Gas, holding in solution different inflammable substances. (p. 9)

Of *Alkohol*. (*Pure Spirit of Wine*)

An intimate combination of Hydrogen and Carbon—
Obtained from the decomposition of vegetable substances
by fermentation.

Of its Preparation and Purification.

Its character—without colour, light, very inflammable, mixes with Water, &c.

United with Oxygen—*Ethers*. How prepared—Their sensible Properties and Uses.

Of its Application in *Medicine*, &c.

Of *Essential Oils*, *Resins* and *Fixed* *or Expressed Oils*.

Their Sources—Preparation and sensible Properties.

Combined with *Alkohol*—*Tinctures*, *Waters*, (*Lavender*, *Rosemary*, &c.) *Varnishes*, &c.

Of their Application in *Medicine*, *Soap-making*, *Painting*, *Varnishing*, *Perfuming*, *Mechanics*, &c.

Of *Camphor*.

Obtained from a species of Laurel (*Laurus camphoratus*. *Linnaeus*.)—In small quantities, from many other plants.

How purified.

Its

Its character—white, concrete, odoriferous, soluble in Alcohol, burns with a white flame, &c.

Of its Application in *Medicine, Preserving Specimens of Natural Curiosities, &c.*

*Of Wax, Fat, Spermaceti, Butter,
Ambergris, &c.*

Their Sources—Purification—Properties and Application.



is composed of white, concrete, soluble
Alcohol, mixed with a few grains of
Oil of Application in Alcohol, and a few
Grains of Camphor.

Of Wax, Fat, Spermaceti, Butter,
Almonds, &c.

These sources of Properties and Application
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